

102 You, an Inventor?



Bioengineers use technology, mathematics, and scientific knowledge to solve practical problems. They often design, build, and test devices or procedures to help people.

In recent years, bioengineers have developed:

- artificial joints.
- magnetic resonance imaging (MRI), which gives us pictures of the soft tissue of the body.
- heart pacemakers.
- arthroscopy, which allows a doctor to repair a joint using microscopy.
- bioengineered skin.

Have you ever thought of yourself as an inventor? You've probably invented solutions to many problems that you face. Being an inventor involves recognizing a problem and then designing, building, and testing devices and procedures to solve the problem. How would you handle the problem of a broken arm? What solutions could you describe?

CHALLENGE



What tools and strategies can you invent to deal with a broken arm?

These university students are making prosthetic devices to help disabled people.



MATERIALS



For the class

- 1 set of 8 Station Cards



For each group of four students

- 1 ball of string
- 1 roll of masking tape
- 2 sheets of card stock



For each pair of students

- 1 triangular sling
- 1 safety pin



For each student

- 1 Student Sheet 102.1, "Recording Solutions"
- 1 clipboard (optional)

The Broken Arm

Yesterday you fell while in-line skating down a hill. Your arm is broken pretty badly and is in a cast from the middle of your upper arm to the first joint of your fingers. The pain and swelling make your fingers useless, which the doctor says will continue for a couple of weeks. And to make matters worse, it's the hand you normally write with! What problems will you face in carrying out the activities of daily life? How can a scientific approach help you to design useful solutions?



In this activity, you will simulate having a broken arm. As you try to perform various tasks, you must assume that you are alone and cannot ask for help. Since your arm and hand are swollen and in pain, you cannot use any part of the arm or hand that is in the sling.



SAFETY

Some of the activities involve eating. Be careful not to contaminate any of the food. Be sure to follow your teacher's instructions about what to do with any used utensils or food containers.

PROCEDURE

1. With your partner, decide who will wear the sling first. One of you will wear the sling to the first half of the stations; the other partner will wear the sling to the other half of the stations.
2. Have the first person simulate a broken arm by putting the dominant arm (the one usually used for writing) in a sling. Look at the photos below to find out how to make a sling.



a.

TYING A SLING

- a. Lay triangular bandage under arm with the point toward the elbow.
- b. Bring up the bottom corner to the other side of the neck.
- c. Tie behind the neck.



b.





c.

3. Go to each station as directed by your teacher and try to perform the task described on the Station Card. You will have to devise a solution to each problem. You can either try to develop a strategy or use the supplies provided to make a simple tool. Try to invent a solution that will allow you to carry out your daily activities independently.
4. As you complete each task, have your partner use Student Sheet 102.1, “Recording Solutions,” to record the tools and strategies you use.
5. After you have visited half of the stations, have your partner wear the sling and repeat Steps 3 and 4.

ANALYSIS

1.
 - a. Describe the most challenging problem you think you would face in everyday life if you broke your arm.
 - b. Use both a written description and a diagram to explain how you would solve this problem.
2. What were the strengths and weakness of putting your arm in a sling to model what it would really be like to break your arm?

Hint: You may want to interview some people who have dealt with real injuries before answering this question. Consider pain and attitudes of others in your answer.

-  3. Even without broken arms, people in all professions, including cooks, cleaners, surgeons, occupational therapists, and plumbers, need to invent solutions to problems in the course of their jobs. Choose a profession and give an example of a kind of problem someone in that profession may need to solve.
-  4.
 - a. Identify a problem you would like to solve.
 - b. Describe a tool you would like to invent to solve this problem.
 - c. How would you start to make the tool you described?